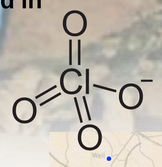
Sampling for Perchlorate At and Around SSFL

Extensive Data Shows Site Releases Remain Close to Where They Entered the Ground

PERCHLORATE OVERVIEW

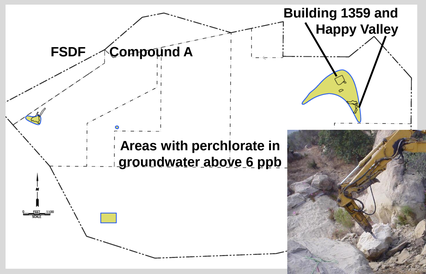
Perchlorate is an anion. It occurs naturally, and has been used by mankind as an oxidant for solid rocket propulsion and in road flares and fireworks. Perchlorate is also found in some fertilizers. In California, a public health goal for drinking water of 6 micrograms per liter (ppb) has been established.



NATURE, EXTENT AND REMEDIATION AT SSFL

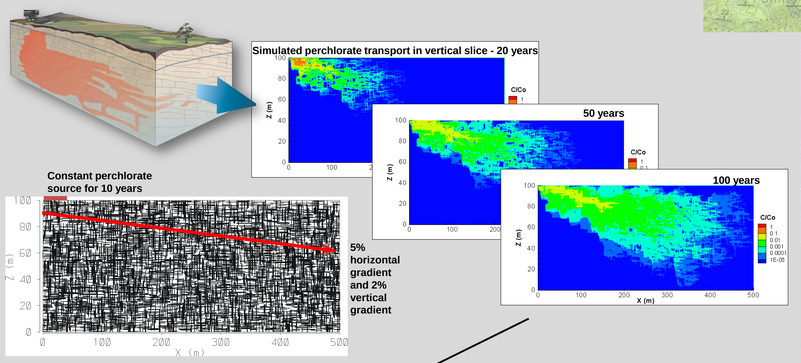
Perchlorate was used at SSFL in small amounts because it was not used as the oxidant in the rocket engines that were tested there. Many soil, soil leachate, groundwater, surface water, and seep samples have been collected and analyzed for perchlorate to define its nature and extent.

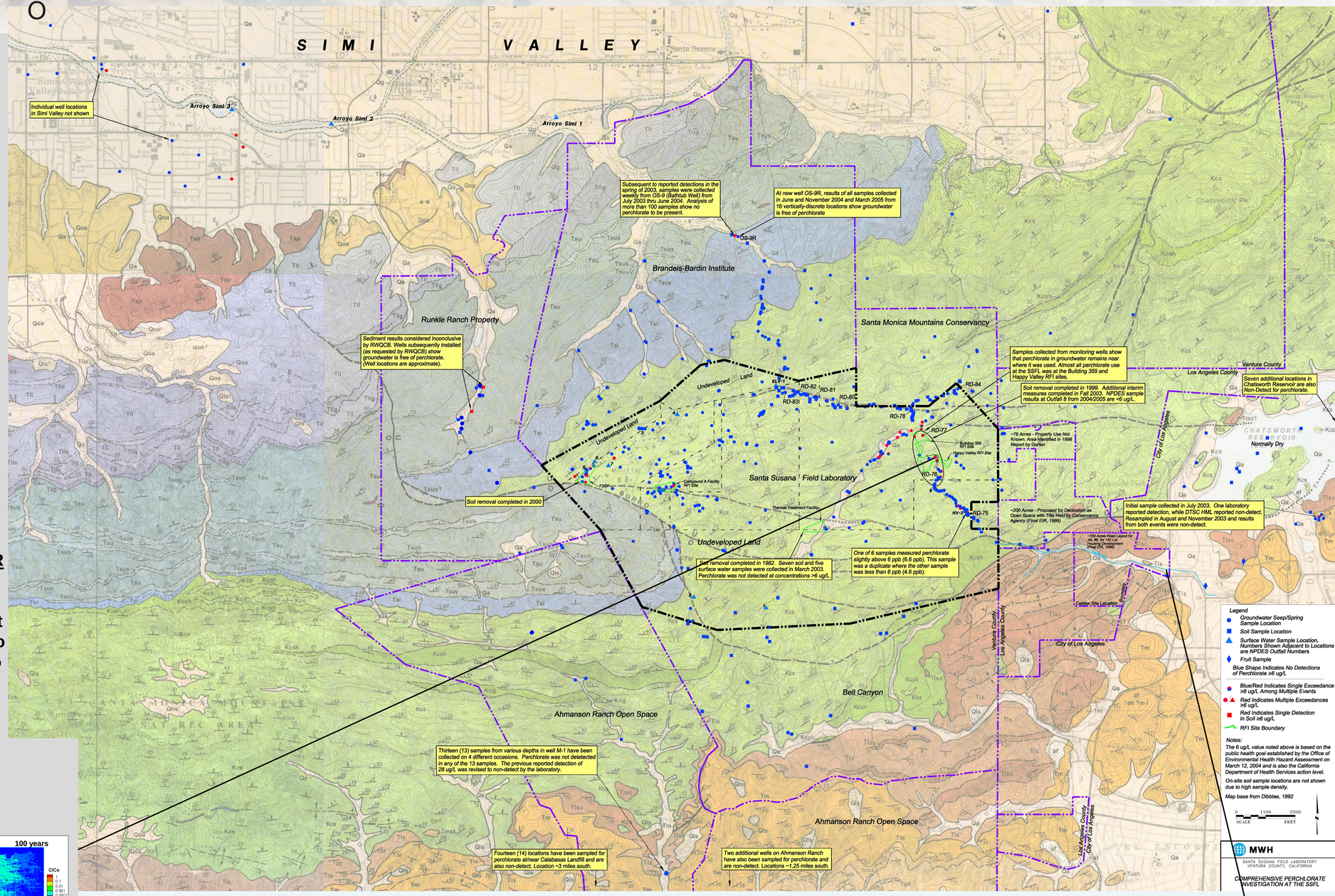
Perchlorate in soil and rock at SSFL has been remediated by excavation and off-site disposal (~8,000 cubic yards (cy)) and *in situ* by bioremediation (~9,000 cy)

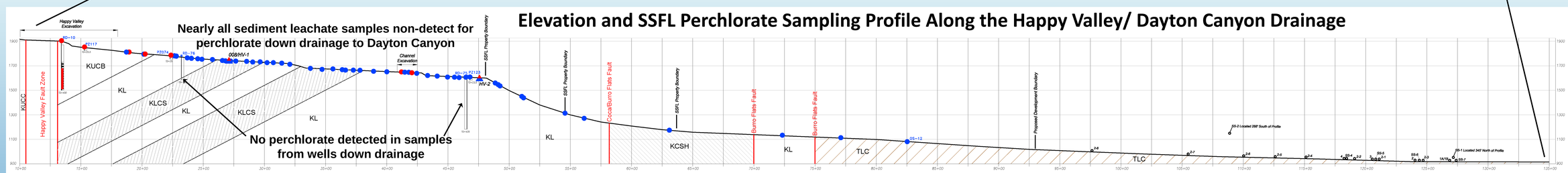


RETARDATION OF PERCHLORATE IN SSFL GROUNDWATER

Unlike granular aquifers, perchlorate transport in the fractured sedimentary rock of the Chatsworth Formation that underlies SSFL moves much slower than groundwater due to matrix diffusion. Site data and transport modeling show it to be within a thousand feet or so of where it entered the ground



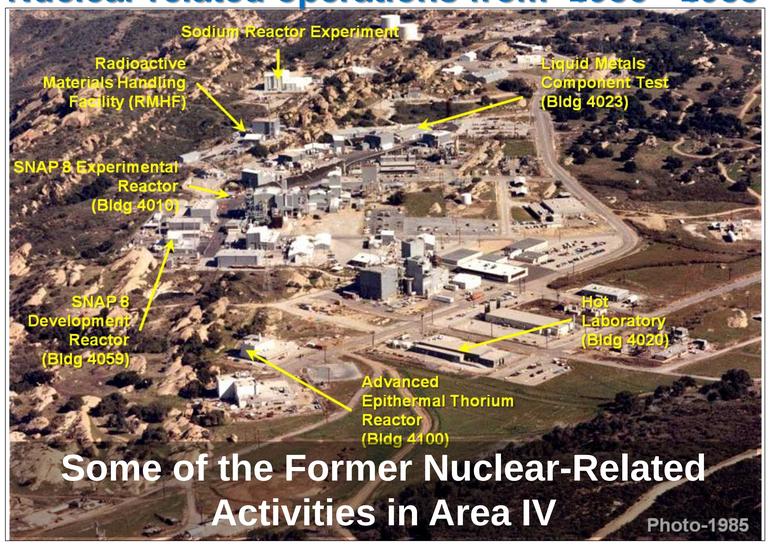




Site Related Tritium in Groundwater

SSFL tritium contamination from nuclear operations shows a small plume consistent with lower permeability and strong matrix diffusion

Nuclear related operations from 1956 - 1983



What is Tritium ?

Radioactive decay isotope of hydrogen with decay half life of 12 years

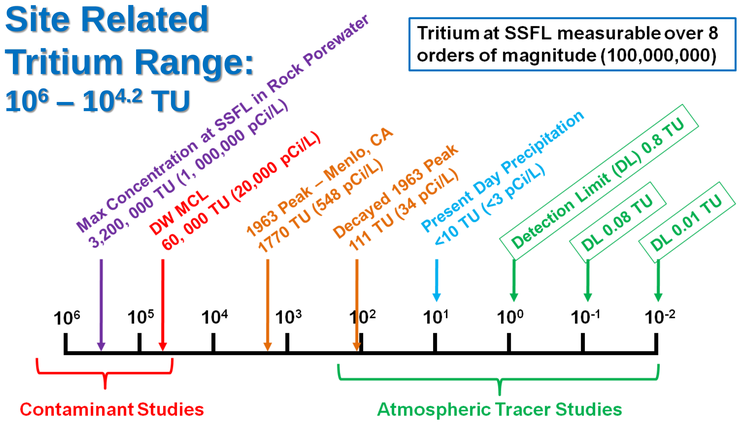
Three Nuclides of the Hydrogen Isotopes:

Protium	Deuterium	Tritium
1 proton	1 proton 1 neutron	1 proton 2 neutrons

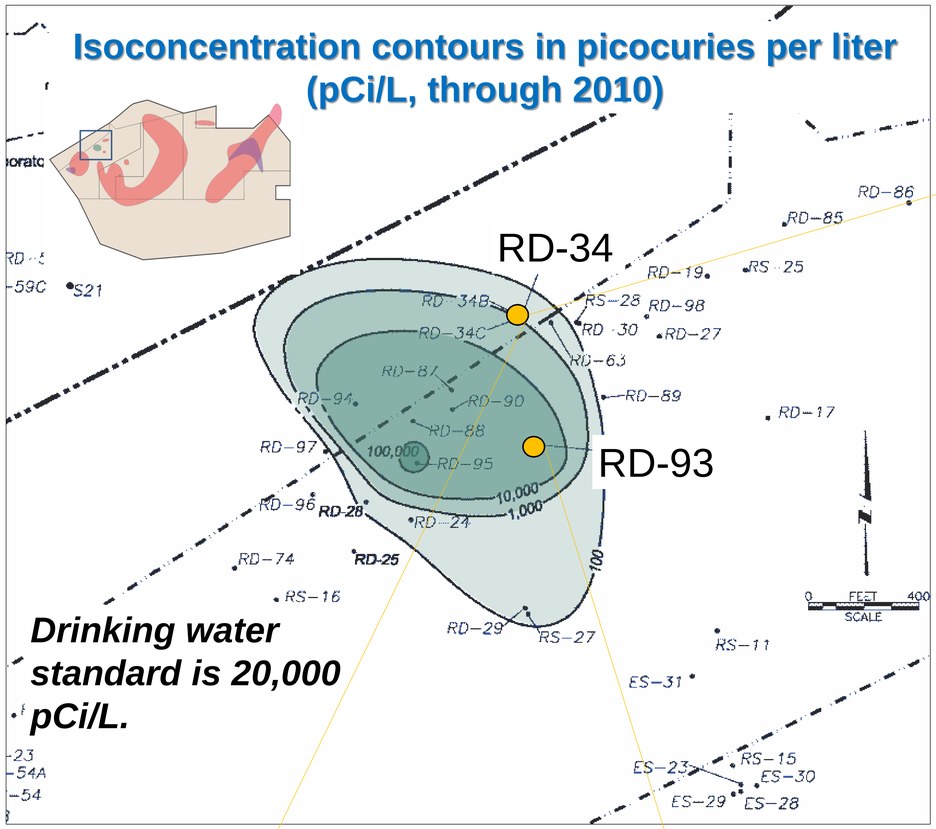
Site Related Tritium Range:

10^6 – $10^{4.2}$ TU

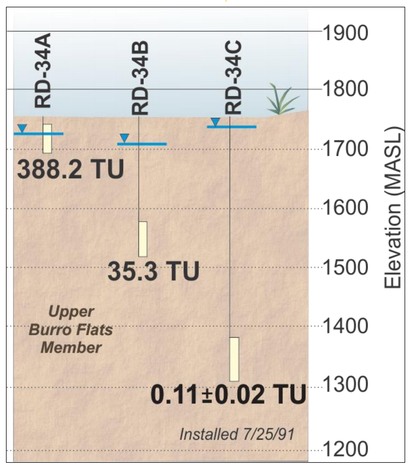
Tritium at SSFL measurable over 8 orders of magnitude (100,000,000)



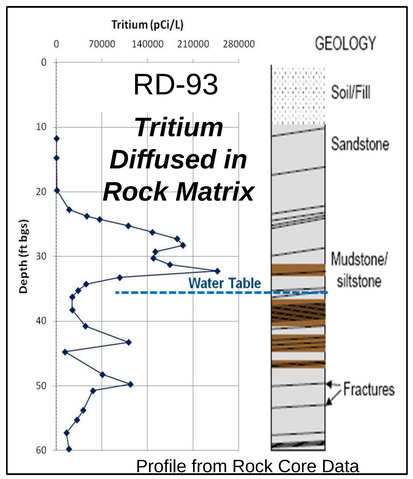
Isoconcentration contours in picocuries per liter (pCi/L, through 2010)



Drinking water standard is 20,000 pCi/L.

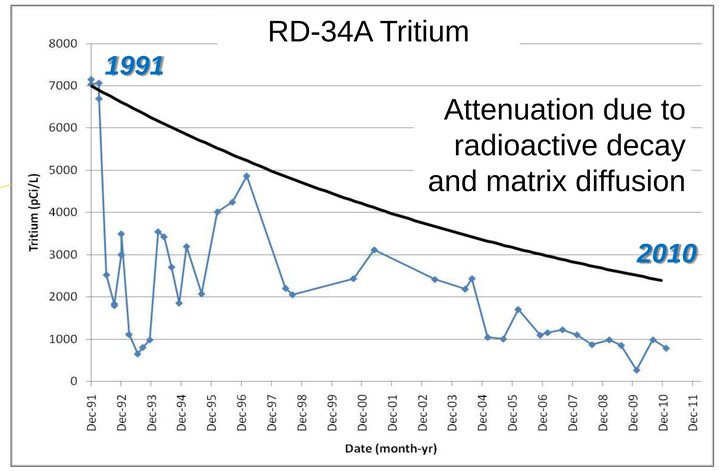


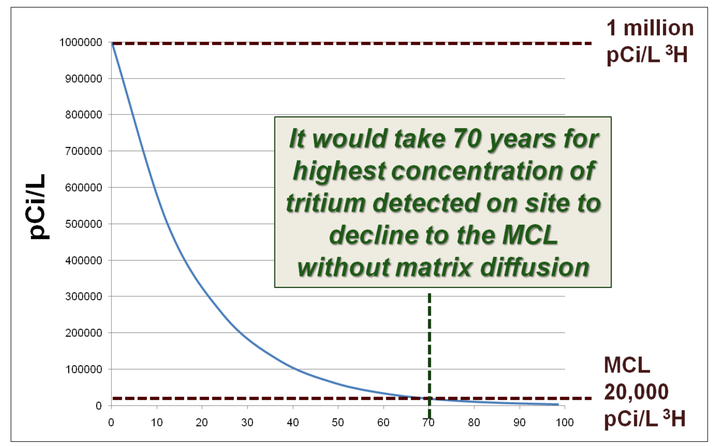
Example of Tritium decrease with depth measured in groundwater samples.



Profile from Rock Core Data

The highest site related tritium concentrations were found in rock core samples

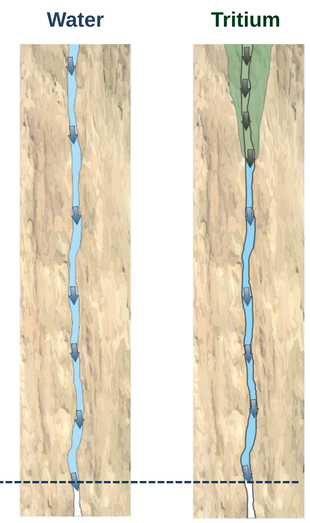




Tritium Plume Front Retardation

As tritium molecules move along fractures diffusion continually causes some of the molecules to be transferred into the rock matrix

Plug Flow Position for Water



Poster Prepared by Kristina Small, G360, June 24th 2011